International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

# DETERMINATION OF SOIL NUTRIENTS USING ARDUINO

**Mukesh Kumar S[1]**

[1] *Student B.E, Electronics and Instrumentation Engg., Kumaraguru College of Technology, Coimbatore*

---

**Abstract -** *Our country, India's economy majorly depends on agriculture. Farmers are facing many problems and percentage of agricultural practice is decreasing rapidly for past few years, this is because of less crop yield, shortage of labors, high labor wages, inadequate knowledge about modern farming, over usage of chemical fertilizers and pesticides and other physical parameters. To control overuse of chemical fertilizers, farmers must know the amount of soil nutrients present in their ground. Determining amount of soil nutrients is traditionally done by taking the soil sample to agricultural test laborites, whereas most of the farmer doesn't show interest to carry the soil sample to laborites and wait for the result. This project is to check the amount of nutrients present in the soil without carrying soil sample. In this method farmers can check their soil's nutrient value remotely and get the result in few minutes. By which we can apply fertilizer to the put where it needs, too we can maintain a strategic distance from over fertilization of the crops. This prevents over use of chemical fertilizers and prevents ecological misbalance. Crop yield will be improved without degrading the soil.*

***Key Words***: **Arduino, Soil NPK sensor, MAX-485, Power efficient, Soil fertility.**

## 1.INTRODUCTION

In India the climatic conditions are isotropic and farmers are not able to make full utilize of agrarian assets. Generation of edit depends on the interaction between soil and plant properties. Maximization of generation of crops is reflected by organic, physical, chemical condition of the soil (SOIL NUTRIENTS). Sensor Systems can help farmers to know about their soil remotely. Amount of NPK is subordinate on trim sort and on plant development status. Amount of fertilizer to be utilized can be determined in few minutes. Since the macronutrients change the crop yield, the amount of NPK should be kept stable. The amount of these nutrients should neither exceed nor decrease, so that the farmers can attain profit without degrading the soil and environment.

### 1.1 Description of Proposed System

This framework illustrates a programmed soil sensor framework for determining the amount of NPK in the agricultural field. The flow-through soil sensor framework is converted to measurable and units using Arduino Nano microcontroller along with Modbus module. The amount of nitrogen, phosphorous and potassium (NPK) are readily displayed through an OLED display. The essential point of this framework to create a touchy and solid soil sensor framework for observing the supplements in soil and make use of it wisely and effectively for long term applications.

### 1.2 Block Diagram Description

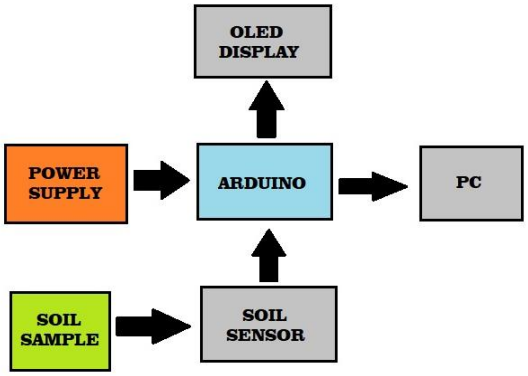


**Figure -1**: Block diagram of the system

## 2. PROPOSED MODEL

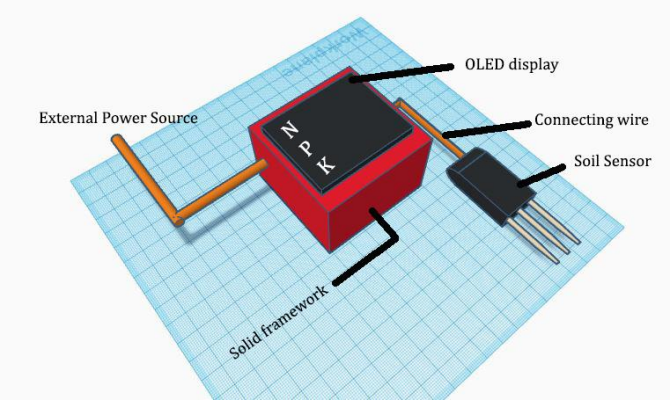


**Figure -2**: 3D model diagram of the system

## 3. SOIL NPK SENSOR – JXCTIOT SOIL NPK SENSOR

The soil NPK sensor is suitable for detecting the content of nitrogen, phosphorus, and potassium in the soil. It helps in determining the fertility of the soil thereby facilitating the systematic assessment of the soil condition. The sensor can be buried in the soil for a long time. It has a High-quality probe, rust resistance, electrolytic resistance, salt & alkali corrosion resistance, to ensure the long-term operation of the probe part. Therefore, it is suitable for all kinds of soil.

It is suitable for the detection of alkaline soil, acid soil, substrate soil, seedling bed soil & coconut bran soil. The sensor doesn't require any chemical reagent. Since it has High measurement accuracy, fast response speed, and good interchangeability. The sensor operates on 9-24V & power consumption is very low.

**Figure -3**: Soil NPK Sensor

### 3.1 Modbus module – MAX 485 module

We cannot use the sensor directly with the microcontroller as it has a Modbus Communication port. Hence you need any Modbus Module like MAX485 and connect the sensor to the microcontroller. It supports up to 2.5MBit/Sec data rates, but as distance goes up, the maximum data rate that can be supported comes down. A significant benefit of MAX485 is that it supports multiple devices (up to 32) on the same cable.

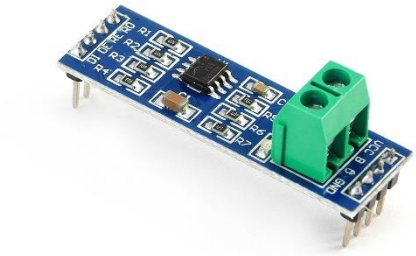

**Fig -4**: MAX 485 module

## 4. ARDUINO NANO MICROCONTROLLER

Arduino is an open source computer equipment that plans and fabricates microcontroller based units for building advanced gadgets and intuitively objects that can sense and control objects in physical world.

These framework gives sets of computerized analog I/O pins, serial communication interfacing, USB port for stacking programs from the individual computer. The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328.

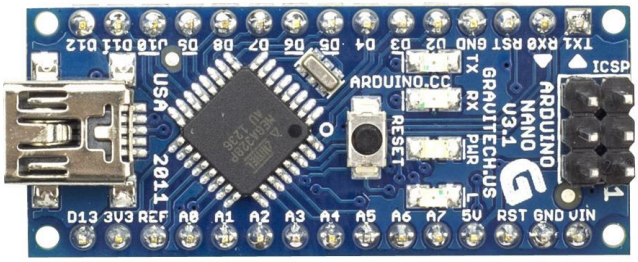


**Fig -5**: ARDUINO NANO Microcontroller

For programming the microcontrollers, it gives an coordinates advancement environment (IDE) based on preparing extend which back for C, C++, Java programming dialects.

## 5. OLED DISPLAY

OLED (Organic Light-Emitting Diode) is a self light-emitting technology composed of a thin, multi-layered organic film placed between an anode and cathode. In contrast to LCD technology, OLED does not require a backlight. OLED possesses high application potential for virtually all types of displays and is regarded as the ultimate technology for the next generation of flat-panel displays. Since we are using OLED Display to display the Soil Nutrient values (Nitrogen, Phosphorous & Potassium) in mg/kg, we must install OLED libraries like Adafruit SSD1306 Library and Adafruit GFX Library.

## 6. CIRCUIT DIAGRAM

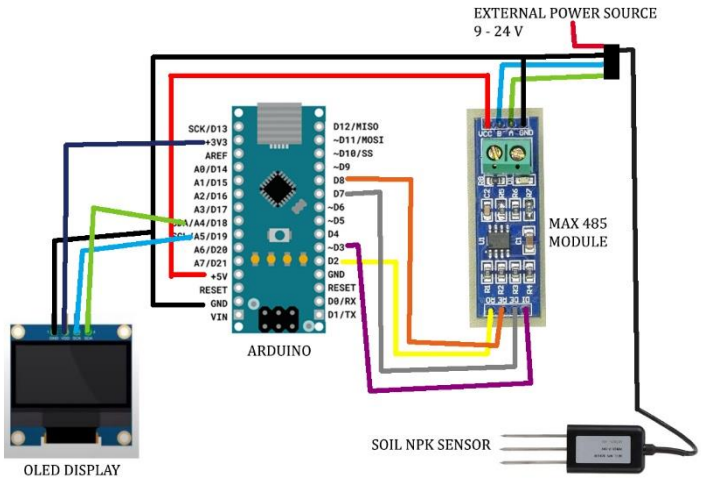


**Fig -6**: Circuit diagram

## 7. CONCLUSIONS

Agriculture remains a key sector for development in every economy. Immersive technologies have the potential to

support smart agriculture for increased productivity. This paper has successfully developed a monitoring system of the nutrients present in the soil using Arduino. The system is easy to use and eco-friendly. This system can be operated without help of PC's just by attaching two 3.7V, 4200mAh, Lithium Ion batteries. With help of these batteries, the system can operate for nearly 27days. This project reduces human effort and can be further developed by introducing IoT's and many more.

## REFERENCES

[1] Salve Akshay, Sagar Sonali, Patne Mahesh, Jangam Omkar, Student B.E. Computer Engg., SVPM COE, Malegaon, Baramati, Pune ,"SOIL NUTRIENT IDENTIFICATION USING ARDUINO AND ELECTROCHEMICAL SENSOR"- IRJET

[2] Soil Nutrient Identification Using Arduino, R.Sindhuja and B.Krithiga (AJAST)

[3] SoilMATTic: Arduino-Based Automated Soil Nutrient and pH Level Analyzer using Digital Image Processing and Artificial Neural Network Ricardo, Eden Alyzza, Karl Angelo, Kathleen Mae, Yashmine Erika, Nilo – IEEE

[4] Bharati Masram, Harsh Mehta, Harshal Bokade, Hritik Jain, Shrawani Wankhede,International Journal of Engineering and Advanced Technology (IJEAT) 2249 – 8958

[5] Microcontroller based groundnut seed sowing and harvesting system (IRJET) 2395-0056

[6] Farmers